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Research Article

Delineating Empathy and Sympathy: A Comparative Bibliometric Analysis and an Operational Indicator Framework (2015-2025)

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ABSTRACT
Empathy and sympathy have been widely recognized as core antecedents of prosocial behavior. However, prior literature has treated the two constructs inconsistently, with sympathy frequently subsumed under an overly broad and ill - defined conceptualization of empathy. This conceptual overlap has limited discriminant operationalization, hindered cumulative theoretical development, and consequently constrained applied precision in interdisciplinary contexts. The present study examined whether empathy and sympathy constituted structurally distinguishable knowledge domains with divergent intellectual foundations and developmental trajectories. A comparative bibliometric analysis was conducted using SSCI-indexed articles retrieved from the Web of Science Core Collection for the period 2015-2025. The dataset comprised 4,413 empathy-related publications and 247 sympathy-related publications. VOSviewer and CiteSpace were employed to perform keyword co-occurrence mapping, document co-citation clustering, burst detection, and strategic coordinate analysis. This study provided the first comparative scientometric evidence to distinguish the structural divergence between empathy and sympathy research. Results showed that empathy research formed a dense, interdisciplinary, and mature thematic structure, whereas sympathy research was relatively small, fragmented, and often subsumed under empathy-related clusters. Based on quantitative mapping and theoretical integration, we developed a four-dimensional operational indicator framework with fifteen second-order indicators. This framework translates structural knowledge patterns into a systematic conceptual reference for future measurement and modeling studies. By combining scientometric analysis with conceptual reconstruction, this study helps clarify a long-standing definitional ambiguity and provides a novel data-driven approach for differentiating overlapping constructs in social science research.

Keywords: Bibliometric Analysis, Empathy, Knowledge Mapping, Operational Framework, Sympathy.

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INTRODUCTION

Empathy and sympathy have been widely recognized as central affective antecedents of prosocial behavior and key emotional mechanisms motivating individuals to respond to others' needs (Eisenberg *et al.*, 2006; Yavuz *et al.*, 2024; Zava *et al.*, 2025). Across developmental, clinical, and social psychological research, both constructs have been consistently linked to helping, sharing, cooperation, and reduced aggression (Eisenberg *et al.*, 2006; Vecchio *et al.*, 2023; Eisenberg *et al.*, 2024). Nevertheless, empathy and sympathy are distinct constructs (Wispé, 1986; Betzler, 2019). Empathy is typically defined as an affective and/or cognitive capacity to share and understand another person's internal state, whereas sympathy refers to other-oriented concern accompanied by evaluative appraisal and maintained emotional distance (Wispé, 1986; Cuff *et al.*, 2014; Malbois, 2023; Salzani, 2025). Despite these distinctions, the conceptual boundary between empathy and sympathy remains unstable across empirical studies, measurement systems, and applied domains.

This instability presents a persistent theoretical challenge. Empathy is often treated as an umbrella construct, implicitly encompassing sympathy and related prosocial emotions. Such conceptual inflation can obscure distinct functional pathways through which affective processes influence helping behavior, moral decision-making, and interpersonal regulation (Bloom, 2016). Empathic responses frequently involve emotional resonance and partial self-other merging, which can facilitate altruistic action but also increase emotional overload under prolonged

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exposure. In contrast, sympathy may support more regulated prosocial engagement by sustaining concern while preserving self-boundaries (Singer and Klimecki, 2014). Systematic reviews further indicate that widely used empathy measures often conflate affective sharing and cognitive perspective-taking, blurring the distinction with sympathy and weakening discriminant validity (Yavuz *et al*., 2024). Conflation of these constructs complicates empirical integration, limits the specification of intervention mechanisms, and reduces measurement precision.

The consequences of this conceptual overlap are particularly evident in applied contexts. In clinical training and caregiving professions, empathy is promoted as a desirable competence, yet excessive empathic engagement has been linked to compassion fatigue and emotional exhaustion (Figley, 2002). In educational psychology, unclear operational boundaries complicate the design of emotion-based training programs targeting specific mechanisms. In human-computer interaction and affective computing, researchers increasingly attempt to model empathy in artificial agents (Gong and Huang, 2023), but it remains unclear whether these systems should simulate affective resonance or provide supportive concern in the absence of affective convergence (Paiva *et al*., 2017; Meng *et al*., 2025). These challenges highlight that differentiating empathy from sympathy is not merely terminological but crucial for theoretical refinement and responsible application.

Despite longstanding interest in their differentiation, existing efforts remain fragmented. First, many studies operationalize empathy and sympathy using partially overlapping scales or composite measures, which limits discriminant validity and produces inconsistent findings (Clark *et al*., 2019). Second, theoretical discussions span diverse disciplines, including philosophy, neuroscience, developmental psychology, and moral psychology, resulting in definitional traditions that are rarely integrated. Third, rapid growth of research over the past decade has made it difficult for narrative reviews to capture the large-scale structure and evolution of empathy- and sympathy-related scholarship. Consequently, although the distinction between empathy and sympathy is widely acknowledged, no widely accepted operational framework currently translates these differences into a structured, process-oriented indicator system.

Bibliometric analysis offers a promising approach to address this gap. By quantitatively analyzing keyword co-occurrence, citation networks, and thematic clusters, bibliometric methods allow identification of intellectual structures, research frontiers, and developmental trajectories at the field level (Chen *et al*., 2010). These methods provide a reproducible strategy for examining how constructs are represented, connected, and differentiated across scientific communities, making them suitable for clarifying concepts characterized by dispersed terminology and heterogeneous citation practices.

However, bibliometric research on empathy and sympathy has largely focused on publication trends rather than comparative conceptual differentiation or operational framework construction. It remains unclear whether the two constructs form structurally distinct research domains and how such differences could be translated into an operational tool. To address this, the present study conducted a comparative bibliometric analysis of empathy-and sympathy-related literature indexed in the Web of Science Core Collection (SSCI) from 2015 to 2025. By integrating keyword co-occurrence mapping, burst keyword detection, document co-citation clustering, and strategic coordinate analysis, the study examined whether empathy and sympathy exhibited distinct thematic organizations, intellectual foundations, and developmental trajectories. Based on bibliometric patterns and classical theoretical literature, a multi-level definitional indicator framework was proposed to operationalize key distinctions across four process-oriented dimensions: motivational orientation and purpose, influencing factors, response characteristics, and outcome manifestations.

This study addressed three primary research questions: Firstly, what were the major thematic structures and evolutionary trajectories of empathy and sympathy research from 2015 to 2025? Secondly, to what extent did empathy and sympathy exhibit distinct intellectual foundations and knowledge clusters in document co-citation networks? Lastly, based on bibliometric patterns and theoretical synthesis, could a coherent definitional indicator framework be constructed to support operational differentiation?

By addressing these questions, the study contributes in three ways: (1) It provides the first systematic comparative mapping of empathy and sympathy research at the field level using bibliometric techniques. (2) It offers evidence-based clarification of conceptual boundaries by identifying divergences in themes, citations, and applications. (3) It translates these findings into an operational indicator framework that supports measurement development, experimental design, and interdisciplinary application. Importantly, the framework is intended as a conceptual reference system rather than a validated psychometric scale.

METHODOLGY

Study Design

This study employed a comparative bibliometric design to map and differentiate the knowledge structures of empathy-and sympathy-related research. Bibliometric techniques were used to analyze research themes, intellectual foundations, and developmental trajectories through quantitative mapping of keywords and citations. The analysis was complemented by theory-informed synthesis to construct a definitional indicator framework.

The study followed a reproducible workflow that included: (1) data retrieval from the Web of Science Core Collection, (2) data cleaning and standardization, (3) keyword co-occurrence analysis, (4) burst keyword detection, (5) document co-citation clustering and timeline analysis, and (6) framework construction through bibliometric-guided theoretical integration.

Data Source And Retrieval Strategy

To ensure transparency and reproducibility, bibliographic data were retrieved from the Web of Science Core Collection (WoSCC). Given that empathy and sympathy are most frequently examined as prosocial affective constructs within social, developmental, and applied psychology, the present study restricted data collection to the Social Sciences Citation Index (SSCI) to maintain conceptual relevance and disciplinary consistency. To maintain conceptual focus and avoid heterogeneity that could blur the targeted comparison, the search was deliberately restricted to the two primary constructs: "empathy" and "sympathy". Although compassion is conceptually adjacent, it is characterized by distinct neural and behavioral profiles (e.g., other-oriented concern without shared distress). Including compassion as a separate search term would introduce a third construct with its own literature base and developmental trajectory, making the comparative bibliometric structure less interpretable. Moreover, preliminary scoping searches indicated that compassion-related publications often overlap with empathy and sympathy in inconsistent ways, further supporting the decision to exclude it from the core comparative design. Accordingly, a systematic topic search was conducted in WoSCC (SSCI) using the following search terms: TS="empathy" and TS="sympathy". The time span was set to 2015-2025, corresponding to the maximum coverage of the most recent decade available for the research question. The search was conducted on December 10, 2025.

Document type classified as Article or Review, the initial retrieval yielded 4,413 records for the topic term *empathy* and 247 records for *sympathy*. Notably, the substantial imbalance[1] suggests that empathy-related research has been considerably more prevalent in SSCI-indexed publications during the study period. Such a discrepancy may also reflect common terminological conventions in which *empathy* is more frequently adopted as a dominant descriptor for other-oriented affective processes, whereas *sympathy* is less often treated as an independent focal construct.

To enhance the validity of the analytical dataset, all retrieved records were screened prior to export. Specifically, titles, abstracts, and keywords were manually reviewed to confirm that each document explicitly addressed empathy or sympathy within social, psychological, behavioral, or applied research contexts. Records clearly irrelevant to the study scope were excluded. Following this screening procedure, all retained records were deemed consistent with the study objectives.

Data Export And Cleaning

Eligible records were exported in plain Text Format (txt) with "Full Record and Cited References" enabled, ensuring compatibility with bibliometric software and allowing co-citation analysis. Retained metadata fields included: Title; Authors; Abstract; Author keywords; Keywords Plus; Journal source; Publication year; WoS subject categories; and Cited references.

Data cleaning procedures were applied to reduce redundancy and enhance consistency. Synonymous terms and spelling variants (e.g., "behavior" vs. "behaviour") were standardized, and singular/plural forms were merged. We employed a thesaurus file in VOSviewer to normalize keywords and reduce fragmentation in co-occurrence mapping.

Finally, the screened datasets for empathy and sympathy were exported separately in plain text format, resulting in two independent and structurally consistent datasets, which served as the final analytical samples for subsequent bibliometric mapping and comparative analysis.

Bibliometric Tools And Parameter Settings

Two widely used bibliometric and knowledge visualization tools were employed: VOSviewer (version 1.6.20; van Eck and Waltman, 2010) and CiteSpace (version 6.3.1; Chen *et al*., 2010).

VOSviewer was designed for constructing and visualizing large-scale bibliometric networks, particularly keyword co-occurrence maps, citation networks, and collaboration structures. Its primary strength lies in its ability to identify thematic clusters based on similarity measures and to represent these clusters using density and distance-based visualizations. In the present study, VOSviewer was primarily used to identify dominant research themes and conceptual proximities within the empathy and sympathy literature.

CiteSpace, by contrast, focuses on the temporal and evolutionary dimensions of scientific knowledge. It is particularly suited for detecting emerging trends, identifying citation bursts, and tracing the development of intellectual bases through document co-citation analysis (Chen, 2006; Chen *et al*., 2010). Timeline and cluster visualizations examined how research emphases related to empathy and sympathy have evolved over the past decade.

The combined use of these tools allowed the study to integrate cross-sectional structural analysis with longitudinal developmental insights. Their complementary strengths enhanced analytical robustness and mitigated potential biases arising from a single methodological perspective. Parameter settings were explicitly defined for reproducibility:

1 The potential impact of this imbalance on network metrics is addressed in the Limitations (Section 5.5.1).

VOSviewer: minimum keyword occurrence = 5; association strength normalization; fractional counting; layout =VOS mapping algorithm; clustering resolution parameter =1.0.

CiteSpace: time slicing =2015-2025; years per slice = 1; term source = title, abstract, author keywords, Keywords Plus; node types = keywords, cited references; selection criteria = top 50 per slice; pruning = pathfinder + pruning sliced networks; cluster labels = Log-Likelihood Ratio (LLR); cluster quality metrics: modularity Q= 0.71, mean silhouette =0.85.

All parameter choices conformed to recommended practices in the bibliometric literature to maximize reproducibility and interpretability.

Framework construction: bibliometric-guided theoretical synthesis

Following comparative bibliometric analyses, high-frequency, high-centrality, and high-burst keywords, as well as the most influential co-citation clusters and core cited references, were extracted according to the predefined thresholds outlined above.

A bibliometric-guided literature synthesis was then conducted to translate recurring conceptual patterns into a definitional indicator framework. This involved four iterative steps:

Step 1: Identification of bibliometrically salient themes representing definitional components of empathy and sympathy.

Step 2: Review of classical and high-impact theoretical literature associated with these themes.

Step 3: Organization of distinctions into a process-oriented, multi-level structure to clarify conceptual boundaries.

Step 4: Iterative refinement of indicator definitions to minimize overlap and ensure operational clarity.

The resulting framework comprises four first-order dimensions and fifteen second-order indicators, designed to support conceptual differentiation and provide operational referencing. This framework is not intended as a validated measurement scale, but as a structured definitional system grounded in convergent bibliometric and theoretical evidence, suitable for guiding future empirical research and cross-disciplinary applications.

DATA ANALYSIS AND RESULTS

Differentiating Empathy and Sympathy Through a Keyword-Based Thematic Analysis

To examine the macro-level thematic composition and conceptual organization of research on empathy and sympathy, this study conducted keyword-based bibliometric analyses of SSCI-indexed literature. Keyword co-occurrence analysis was used to identify high-frequency terms and their relational patterns, thereby revealing dominant research themes, structural configurations, and differences in research maturity across the two domains.

Keyword Co-occurrence Analysis

Keyword co-occurrence analysis captures how frequently specific concepts appear together within the same publication, thereby providing insight into the internal thematic structure of a research field. Separate co-occurrence networks were generated for empathy and sympathy using VOSviewer, with thresholds set to ensure comparability across the datasets.

Analysis of International Literature: Differences In Research Maturity And Structural Organization

The keyword co-occurrence network for empathy research exhibits a relatively large number of nodes and dense interconnections (Figure 1). Multiple clusters were clearly identifiable, with central clusters organized around core concepts such as *empathy, cognitive empathy, affective empathy, prosocial behavior*, and *emotion regulation*. These clusters were interconnected through numerous bridging keywords, suggesting a high degree of thematic integration within the field.

In addition to core psychological constructs, empathy-related clusters extended into applied and interdisciplinary domains, including *mental health, clinical empathy, education, communication*, and *technology-mediated interactions*. The presence of these clusters, along with their close connections to foundational concepts, indicated that empathy research had developed a multilayered and systematically organized knowledge structure.

By contrast, the keyword co-occurrence network map for sympathy was noticeably sparser (Figure 2). The number of high-frequency keywords was smaller, and the connections among them were weaker. While several clusters could be identified, their boundaries were less distinct, and cross-cluster linkages remain limited. Core keywords included *sympathy, guilt, moral emotion, children, adolescents*, and *social behavior*. These terms tended to cluster around specific developmental or moral contexts rather than forming a unified conceptual core.

Quantitative comparisons of high-frequency keywords further elucidated these differences (Tables 1-2). In the empathy dataset, the keyword *empathy* showed a markedly higher frequency and total link strength than any other term (Occurrences = 616; Links = 317; Total link strength = 2987), indicating its clear dominance as the central organizing concept. In the sympathy dataset, however, sympathy (Occurrences =90; Links =60; Strength =307) and empathy (Occurrences =65; Links =55; Strength =257) both appeared among the most frequent keywords, with relatively similar link strengths. This pattern suggested that sympathy research frequently cited empathy as a reference construct. This finding reflects ongoing conceptual overlap and reinforces the view that empathy often subsumes sympathy and related prosocial emotions.

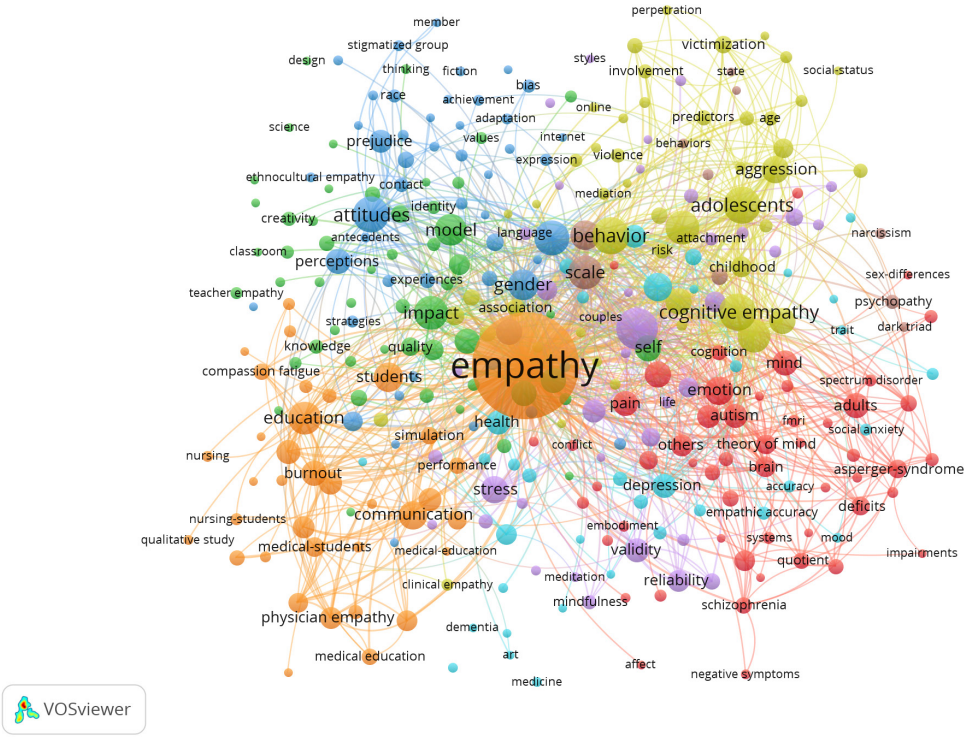


Figure 1: Keyword co-occurrence network map for empathy.

Moreover, the empathy dataset displayed a stronger representation of mechanism-and measurement-related terms, such as validation, cognitive empathy, perspective-taking, scale, and impact (Table 1). This indicated a systematic effort to operationalize empathy and clarify its internal structure through empirical measurement refinement. In contrast, sympathy-related high-frequency keywords were more context-embedded and evaluative, emphasizing moral emotion and developmental settings, including *guilt, emotions, childhood, support, and aggression* (Table 2). Collectively, these patterns suggested that empathy research was organized around component-based psychological mechanisms, whereas sympathy research was more strongly structured around moral-developmental and caregiving-related contexts.

Integrated Comparison and Key Findings

A cross-dataset comparison of keyword co-occurrence patterns revealed several consistent structural differences.

Regarding research maturity, empathy research exhibited a more consolidated and internally coherent thematic structure. Its keyword network was characterized by higher density, clearer clustering, and stronger interconnections, which were consistent with a field that had undergone sustained theoretical development and empirical expansion.

In addition, the thematic emphases of the two domains differed. Empathy research showed strong representation of measurement-related terms, mechanism-oriented concepts, and interdisciplinary applications. Sympathy research, in contrast, placed greater emphasis on moral emotions, developmental stages, and social evaluative processes.

Furthermore, both datasets included high-frequency references to *adolescents*, indicating shared attention to this population. However, sympathy research also showed a stronger association with *childhood*-related terms, suggesting a different developmental focus. Additionally, *prosocial behavior* appeared prominently in both networks and served as a shared outcome-related concept, and provided a common analytical reference point for subsequent comparative analysis.

Overall, keyword co-occurrence results provided initial bibliometric evidence that empathy constitutes a more centralized and integrated thematic domain, whereas sympathy displayed a relatively dispersed structure that remained strongly intertwined with empathy terminology. This divergence offered preliminary support for the argument that empathy and sympathy were not interchangeable and may correspond to distinct yet overlapping conceptual traditions.

Strategic positioning of keywords and identification of research frontiers

To further assess the developmental status and potential trajectories of research themes, this study combined strategic positioning analysis with burst keyword detection. These methods

provided complementary perspectives on thematic prominence and temporal dynamics.

Keyword Strategic Positioning Based on the Boston Matrix

Using an adapted Boston Matrix framework, keywords were mapped according to research intensity (horizontal axis) and developmental potential (vertical axis), based on frequency and network centrality (Figure 3).

In empathy research, several keywords were located in Quadrant I (high intensity, high potential), including *adolescents, prosocial behavior*, and *cross-cultural communication*. These terms represented themes that were both well-established and actively evolving. Quadrant II (high potential, lower intensity) included keywords such as *perspective taking, pain empathy*, and *impact*, indicating areas with emerging research momentum.

In sympathy research, Quadrant I contained fewer keywords, with *understanding* and *adolescents* among the most prominent. Quadrant II included *moral emotion, moral sense*, and *emotion*, suggesting areas where future research activity may expand. Quadrant IV (high intensity, lower potential) included *prosocial behavior, aggression*, and *self-compassion*, indicating relatively stable but less rapidly developing themes.

Overall, the strategic positioning results highlighted differences in internal developmental dynamics between the two domains. Empathy research exhibited a broader distribution of themes across quadrants, suggesting diversified growth pathways, whereas sympathy research showed a more concentrated thematic profile, with its development potential largely centered on moral-emotional and developmental processes.

Identification of research frontiers through burst keyword analysis

Burst keyword analysis was conducted using CiteSpace to identify terms with sharp increases in usage over specific time periods (Tables 3-4). These burst patterns provide insight into shifting research priorities.

In the empathy dataset, early bursts were primarily associated with neurophysiological and perceptual terms, such as social cognition (Burst =8.07), brain (Burst = 3.44), perception (Burst =11.71), and autism (Burst =11.30). Subsequent burst terms included emotional empathy (Burst = 6.64), neuroscience (Burst = 6.51), and affective empathy (Burst =6.89), indicating a sustained emphasis on differentiating empathy components and uncovering underlying neural mechanisms. Importantly, later burst terms such as burnout (Burst =14.59) and depression (Burst =15.55) suggested that empathy research had progressively

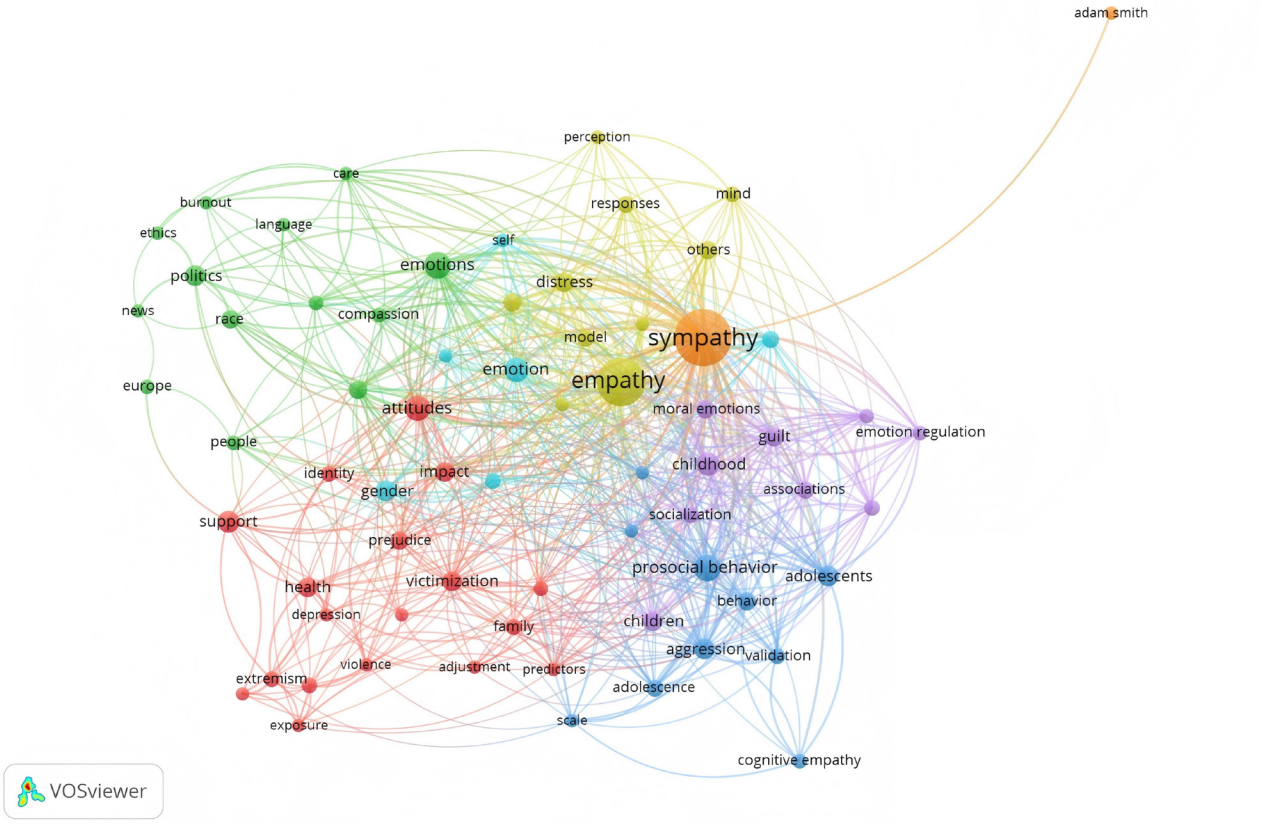


Figure 2: Keyword co-occurrence network map for sympathy.

Table 1: Top 10 co-occurrence keywords for empathy.

Sl. No.	Label	X	Y	Cluster	Occurrences	Links	Strength	Year
1	Empathy	-0.1035	-0.0768	7	616	317	2987	2024
2	Validation	0.2563	0.042	5	92	210	633	2024
3	Behavior	0.1714	0.345	4	77	193	498	2024
4	Cognitive Empathy	0.5841	0.0962	4	77	187	518	2024
5	Adolescents	0.5976	0.445	4	76	161	510	2024
6	Attitudes	-0.6051	0.4123	3	71	159	395	2024
7	Perspective-Taking	-0.0202	0.3383	3	69	174	457	2024
8	Prosocial Behavior	0.4067	0.37	4	62	130	368	2024
9	Impact	-0.4094	0.0939	2	61	159	354	2024
10	Scale	0.0912	0.2256	8	61	153	367	2024

Table 2: Top 10 co-occurrence keywords for sympathy.

Sl. No.	Label	X	Y	Cluster	Occurrences	Links	Strength	Year
1.	Sympathy	0.5229	0.3227	7	90	60	307	2020
2.	Empathy	0.2859	0.1983	4	65	55	257	2020
3.	Prosocial Behavior	0.5321	-0.3368	3	20	36	76	2020
4.	Emotions	-0.2411	0.5324	2	20	34	70	2019
5.	Attitudes	-0.2974	0.1207	1	19	29	55	2020
6.	Emotion	-0.0133	0.2323	6	16	28	44	2019
7.	Childhood	0.5368	-0.0385	5	15	32	78	2019
8.	Support	-0.84	-0.2026	1	14	17	24	2021
9.	Aggression	0.5255	-0.5689	3	12	35	66	2019
10.	Adolescents	0.8789	-0.3606	3	12	28	62	2019

expanded toward applied psychological outcomes and mental health implications, reflecting increasing scholarly attention to the potential emotional costs of empathic engagement.

In the sympathy dataset, burst keywords emerged earlier and were mainly concentrated around caregiving- and morality-related contexts, including distress (Burst =2.16), family (Burst = 1.65), children (Burst =2.99), and victimization (Burst =1.65). More recent burst terms included support (Burst =2.68), guilt (Burst =2.40), and grief (Burst =1.83), indicating a continued emphasis on supportive responses to negative emotional states and the moral-evaluative processes that accompany them.

Taken together, the burst keyword patterns revealed distinct temporal trajectories between the two domains. Empathy-related research demonstrated a frontier shift from neurocognitive foundations toward broader clinical and applied psychological contexts, whereas sympathy-related research remained comparatively centered on moral developmental pathways and caregiving-oriented emotional support. These temporal differences further suggested that empathy and sympathy were not merely terminological variants but might represent two knowledge structures with different developmental logics and thematic priorities.

Differences in co-citation clustering between empathy and sympathy

To examine differences in intellectual foundations and theoretical organization, document co-citation clustering analysis was conducted using SSCI-indexed literature retrieved from the Web of Science. CiteSpace was used to generate co-citation networks and timeline visualizations for empathy and sympathy research separately.

Co-citation clustering in empathy research

The empathy co-citation network produced 8 major clusters, 6 of which showed high silhouette values, indicating clear internal consistency (Table 5). Cluster labels generated by the LSI and MI algorithms exhibited substantial overlap, suggesting close conceptual alignment among subfields.

Clusters #0 and #1 focused on affective empathy and prosocial behavior, with Cluster #1 representing more recent publications. Cluster #0 (Size=58; Average year=2014), labeled "affective empathy"and "trait empathy", reflected foundational conceptualizations emphasizing empathic concern and applied contexts such as medical education and nursing.Cluster #1 (Size =56; Average year=2020), labeled "affective empathy"

and "prosocial behavior", linked to the Perth Empathy Scale, reflected more recent consolidation and operational refinement. These clusters collectively indicated that empathy research had increasingly developed multidimensional and measurable frameworks that integrated psychological components with applied outcomes (Bernhardt, 2012; Weisz, 2021).

Cluster #2 (Size=51; Average year=2011), labeled "emotional empathy", "cognitive empathy", and "distinct neural networks", highlighted the enduring neurocognitive orientation of empathy scholarship (Kesner, 2017). The thematic coherence of this cluster suggested that a major intellectual tradition in empathy research was grounded in differentiating emotional resonance from cognitive perspective-taking and identifying their distinct neural and communicative correlates. Cluster #3 (Size=38; Average year=2017), labeled "mediating role" and "medical student", further indicated that empathy was extensively examined in applied professional contexts, particularly in medical education and clinical practice, where empathy was conceptualized as both a psychological trait and an intervention-relevant competence.

Timeline analysis indicated a relatively continuous developmental pattern, with newer studies extending earlier theoretical frameworks rather than replacing them. Overall, the empathy co-citation structure reflected a cumulative intellectual trajectory characterized by conceptual differentiation, measurement refinement, and sustained interdisciplinary expansion.

Co-citation clustering in sympathy research

The sympathy co-citation network generated a larger number of clusters, but only 4 exhibited high silhouette values (Table 6). These clusters were nonconsecutive and showed limited overlap in label terms across algorithms, indicating weaker internal integration and less cumulative continuity than observed in empathy research.

Clusters #0 and #5 focused on the relationship between sympathy and guilt, particularly moral guilt. Cluster #0 (Size=25; Average year =2013), labeled "developmental psychophysiological study" and "resting heart rate guilt", suggested that sympathy research was strongly anchored in developmental and physiological approaches that examined moral emotion regulation. Cluster #5 (Size=12; Average year=2018), labeled "ethical guilt" and "sympathy", further demonstrated the conceptual centrality of moral guilt and evaluative control processes in sympathy scholarship. Core studies in these clusters examined how sympathy interacted with attentional control and moral evaluation to influence prosocial behavior.

In addition, Clusters #2 and #6 emphasized developmental and contextual factors. Cluster #2 (Size=16; Average year =2017), labeled "social trust" and "late adolescence", highlighted the association between sympathy and civic competence in adolescent development. Cluster #6 (Size=10; Average year=2014), labeled "promoting inclusion via cross-group friendship", indicated that sympathy was studied as a mediating mechanism linking interpersonal relationships to inclusive and prosocial behaviors, particularly in intergroup contexts. These clusters collectively suggested that sympathy research tended to be situated within narrower moral-developmental and social-contextual frameworks rather than within a broad mechanism-based system.



Figure 3: Strategic positioning of keywords and identification of research frontiers.

Table 3: Top 10 burst-words of empathy.

Sl. No.	Label	Year	Degree	Centrality	Freq	Sigma	Burst	Burst Time (2015-2025)
1.	Social Cognition	2015	32	0.09	184	2.05	8.07	
2.	Brain	2015	28	0.02	161	1.07	3.44	
3.	Perception	2015	24	0.04	104	1.55	11.71	
4.	Autism	2015	19	0.03	38	1.45	11.3	
5.	Emotional Empathy	2015	23	0.02	85	1.13	6.64	
6.	Neuroscience	2015	26	0.03	79	1.24	6.51	
7.	Burnout	2019	16	0.02	66	1.28	14.59	
8.	Affective Empathy	2016	24	0.02	109	1.12	6.89	
9.	Depression	2017	19	0.03	77	1.52	15.55	
10.	Associations	2018	26	0.04	96	1.45	8.53	

Table 4: Top 10 burst-words of sympathy.

Sl. No.	Label	Year	Degree	Centrality	Freq	Sigma	Burst	Burst Time (2015-2025)
1.	Distress	2015	17	0.05	7	1.1	2.16	
2.	Family	2015	14	0.04	6	1.07	1.65	
3.	Children	2016	17	0.03	7	1.1	2.99	
4.	Emotions	2016	21	0.1	7	1.15	1.54	
5.	Victimization	2017	21	0.14	6	1.25	1.65	
6.	Health	2016	8	0.02	5	1.03	1.59	
7.	Prosocial Behavior	2018	38	0.18	16	1.53	2.5	
8.	Guilt	2022	7	0.03	4	1.08	2.4	
9.	Support	2015	12	0.17	9	1.52	2.68	
10.	Grief	2024	6	0.07	3	1.13	1.83	

Compared with empathy, sympathy clusters were more narrowly focused and less interconnected, with thematic development concentrated within specific domains.

Integrated comparison: bibliometric evidence for intellectual differentiation

When the two co-citation networks are compared, empathy research exhibits a more integrated and cumulative intellectual structure, whereas sympathy research shows a more fragmented configuration. This divergence is reflected in cluster stability, temporal continuity, and thematic breadth.

Specifically, the empathy network demonstrates a coherent cluster configuration spanning affective empathy, cognitive empathy, prosocial behavior, and applied professional domains (Clusters #0-#3), with most clusters exhibiting high silhouette values and continuous development patterns over time. These findings suggest that empathy scholarship has formed a relatively consolidated knowledge base, integrating theoretical differentiation with measurement development and application-oriented research.

In contrast, sympathy research appears to rely on more domain-specific intellectual foundations, particularly moral guilt and evaluative regulation (Clusters #0 and #5), as well as developmental and social-contextual pathways such as trust, inclusion, and intergroup friendship (Clusters #2 and #6). The limited number of high-silhouette clusters and the nonconsecutive cluster distribution suggest weaker integration across subfields and less cumulative theoretical consolidation.

Importantly, these co-citation results align with the keyword-level evidence reported in Section 3.1. Empathy research is structured around component differentiation (e.g., affective vs. cognitive empathy) and regulation-related outcomes, whereas sympathy research is anchored in moral-developmental processes (e.g., guilt, victimization, and caregiving-related support). Taken together, these convergent bibliometric findings provide robust support for the claim that empathy and sympathy represent partially overlapping yet structurally distinct research domains. This differentiation provides an empirical foundation for the process-oriented definitional indicator framework proposed in this study. The framework aims to translate bibliometric

Table 5: Cluster analysis of empathy literature.

Cluster ID	Size	Average Year	Label (LSI)	Label (LLR)	Label (MI)	Categories	The Major Citing Article of Cluster	The Most Cited Members of Cluster
#0	58	2014	Affective empathy; Trait empathy	Empathic concern; medical student	Neurodevelopmental disorder	Nursing	Batchelder *et al.* (2017) developed the multidimensional Empathic Components Questionnaire (ECQ).	Cuff (2016) introduced the concepts, characteristics, and evolutionary stages of empathy.
#1	56	2020	Affective empathy; prosocial behavior	Perth empathy scale	neurodevelopmental disorder	Multidisciplinary Sciences	Campos (2023) proposed that empathy research should be examined across dimensions such as components, antecedents, and mediating variables.	Weisz (2021) proposed that empathy is a dynamic system formed through interactions across three levels: neural mechanisms, individual psychology, and social interaction.
#2	51	2011	Emotional empathy; cognitive empathy	Distinct neural network	autistic empathy; autistic other	Neuro sciences	Kesner (2017) reported that distinct emotional expression in art communication elicits emotional empathy, while the representational specificity of scenes drives cognitive empathy.	Bernhardt (2012) constructed a triple neural system model comprising emotion sharing, theory of mind, and empathy regulation.
#3	38	2017	Mediating role; medical student	Chinese adolescent	neurodevelopmental disorder	Family Studies	Sommerlad *et al.* (2021) confirmed the association between empathy levels and factors such as age, gender, education, family, and income.	Hall and Schwartz (2019) reviewed the definitions, applications, and methodological approaches to empathy, focusing on conceptual frameworks, variability in measurement.

divergence into operational criteria across four dimensions: motivational orientation and purpose, influencing factors, response characteristics, and outcome manifestations.

Differentiating empathy and sympathy from the perspective of classical literature: a bibliometric-guided review

Building on the macro-level bibliometric contrasts identified above, we conducted a focused review of classical and cluster-central works, prioritizing highly cited, high-burst, and structurally pivotal references. This bibliometric-guided reading strategy enabled a theory-informed examination of how empathy and sympathy have been historically defined, debated, and operationalized across nearly five decades. Rather than treating the two constructs as interchangeable prosocial emotions, the review extracted recurrent conceptual boundaries that consistently appeared across influential theoretical traditions. These micro-level distinctions provided a direct conceptual basis

for constructing the definitional indicator framework presented in Section 4.

Differences in motivational orientation and purpose

Motivation represents the initiating force of prosocial emotion and the functional direction of helping intentions. Empathy is typically characterized by spontaneous affective engagement and experiential resonance (Buchanan and Preston, 2018). Batson's (1987) seminal argument positioned empathy as a core motivational source of altruistic behavior: empathic concern emerges when individuals emotionally share another person's distress, generating an impulse to relieve suffering through a "feeling with" process (Barnett, 1981; de Waal, 2008). This empathic motivation may reflect relatively pure altruistic concern (Holloway, 2020), but it may also coexist with self-oriented discomfort regulation, often conceptualized as empathic distress. In such cases, helping serves dual functions-supporting the target while simultaneously alleviating the observer's own aversive shared affect-consistent with the experiential logic of emotional co-suffering (Batchelder *et al*., 2017).

By contrast, sympathy is more strongly shaped by cognitive appraisal and normative constraint. De Waal (2009) emphasized that sympathy is generally less automatic and more evaluative than empathy, arising through a process of understanding, moral judgment, and perceived deservingness. Sympathy therefore reflects concern-based orientation rather than experiential merging. While sympathy can motivate altruistic behavior, individuals typically maintain clear self-boundaries, and helping is more likely to remain conditional upon not substantially compromising one's own interests. In some contexts, sympathy

Table 6: Cluster analysis of sympathy literature.

Cluster ID	Size	Average Year	Label (LSI)	Label (LLR)	Label (MI)	Categories	The Major Citing Article of Cluster	The Most Cited Members of Cluster
#0	25	2013	Developmental psychophy -siological Study	Resting heart rate guilt	Developmental diary study	Psychology educational	Colasante and Malti (2017) provided evidence that compassion/ sympathy and guilt are the core emotions that inhibit aggressive behavior.	Ongley and Malti (2014) found that children's moral emotions, including sympathy, were associated with sharing behavior, indicating a role of empathy-related affective processes in prosocial action.
#2	16	2017	Social trust; Late Adolescence	Late Adolescence; Social trust	Longitudinal association; Civic Competencies	psychology	Grutter (2021) conducted research on compassion/ sympathy during the development of the COVID-19 pandemic.	Waller *et al.* (2020) Empirical evidence suggested that higher callous-unemotional traits are associated with reduced affective and cognitive empathy
#5	12	2018	Ethical guilt; sympathy	Ethical guilt	Link; Sympathy Moderate; attentional	Psychology experimental	Dys (2023) suggested the moderating effect of attentional control on the relationship between compassion/ sympathy and moral guilt.	Malti & Dys (2018) revealed the relationships among three moral emotions: sympathy, empathy, and empathic guilt.
#6	10	2014	Promoting inclusion via Cross-group friendship	Promoting inclusion; Trust	Promoting Inclusion	Psychology educational	Grutter *et al.* (2018) reported the mediating effect of compassion/ sympathy on the relationship between cross-group friendships and inclusive behavior.	Malti (2016) proposed an integrated clinical-developmental model of guilt that synthesizes evidence on how moral emotions such as empathic guilt are linked with empathy and adaptive, other-oriented behaviors, including prosocial action, across development.

may also carry implicit benevolence rooted in perceived social distance or status asymmetry (Holloway, 2020). Overall, empathy is primarily oriented toward sharing another's suffering, whereas sympathy is oriented toward understanding and alleviating it without emotional substitution.

Differences in behavioral and affective outcomes

Although both emotions may elicit prosocial behavior, their behavioral tendencies and affective consequences differ in systematic ways. Empathy tends to generate more emotionally driven and self-involving outcomes. Because empathizers partially internalize another's affective state, helping behavior may be immediate, impulsive, and more tolerant of personal cost (Krebs, 1975). Empathy thus produces not only observable helping actions but also strong internal affective experiences such as shared sorrow, relief, or emotional exhaustion. Empathy has also been linked to reduced aggression and sustained prosocial engagement under certain conditions (Miller and Eisenberg, 1988; Malti and Dys, 2018).

In contrast, sympathy-based outcomes are typically more regulated and cognitively guided. Sympathy involves emotional distance and a preserved self-other boundary, which supports calmer and more deliberative assistance. Sympathy-driven helping is therefore more likely to remain within the scope of "helping without self-harm" (Escalas and Stern, 2003a), and its expression is often shaped by moral reasoning and social norms rather than affective immersion (Song *et al*., 2018; Malti and Dys, 2018). Compared with empathy, sympathy is generally associated with weaker affective intensity but stronger self-regulation and rational constraint in decision-making (Oveis, 2010).

Differences in influencing factors

This section distinguishes the key factors influencing the emergence and expression of empathy and sympathy across two levels: physiological foundations and situational cues.

Physiological foundations

Neuroscientific evidence provided robust support for differentiating empathy and sympathy. Empathy was closely associated with the mirror neuron system and emotional sharing networks. When individuals empathize, brain regions related to personal emotional experience, such as the anterior insula and anterior cingulate cortex, were frequently activated, forming the neural basis of "feeling with" another (Bernhardt, 2012; Preston and de Waal, 2002). This process was largely bottom-up and relatively automatic, reflecting emotional simulation.

Sympathy, by contrast, is more closely linked to top-down regulation and cognitive appraisal processes. It involves stronger engagement of neural systems associated with valuation, moral judgment, and social cognition, such as the medial orbitofrontal cortex and ventral striatum (Klimecki *et al*., 2014; Singer *et al*., 2004). Thus, empathy is rooted in affective resonance, whereas sympathy is more dependent on evaluative concern and cognitive control.

Situational contexts and cues

Empathy is more readily elicited by vivid and concrete emotional cues, such as salient facial expressions of pain or emotionally intense narratives (Kesner, 2017; Brethel-Haurwitz and Marsh, 2018; O'Connell, 2019; Heyers *et al*., 2025). Self-other similarity and interpersonal closeness further amplify empathic activation (Cikara and Van Bavel, 2014).

Sympathy relies more heavily on interpretive appraisal. Individuals often evaluate whether the target's suffering is unfair, undeserved, or morally salient, and sympathy may arise even when affective cues are not particularly intense (Batson and Eklund, 2007). Sociocultural norms and moral values therefore exert a stronger shaping influence on sympathy than on empathy.

Differences in Response Characteristics

At the level of emotional response patterns, empathy and sympathy can be differentiated across three key dimensions.

Emotional versus rational orientation

Empathy is characterized by high affective involvement and emotional resonance, in which individuals experience an internal simulation of another's suffering (Han, 2017). Such empathic states are often accompanied by physiological arousal, including heightened stress-related activation (Batchelder *et al*., 2017; Campos *et al*., 2023). Sympathy, in contrast, reflects concern-based understanding rather than emotional substitution. Individuals acknowledge another's distress and feel compassion while remaining relatively emotionally stable.

Self-other relationship boundaries

Empathy is often associated with partial self-other integration. In empathic immersion, psychological boundaries may become blurred, producing a sense of shared identity or "we-ness." Sympathy preserves a clearer self-other separation, reflecting an "I-you" structure in which concern is expressed without emotional merging (Escalas and Stern, 2003a). Experimental evidence from pain-empathy paradigms further supports this distinction, indicating that empathy often manifests as an instinctive resonance response, whereas sympathy involves more socially regulated processing.

Perspective of attention

Empathy typically adopts a first-person experiential stance, entering the other's internal world through "feeling into" processes (Darwall, 1998). Sympathy adopts a more external observational stance, reflecting "feeling for" rather than "feeling as." In short, empathy is grounded in shared experiential resonance, whereas

sympathy reflects caring concern with emotional distance (Darwall, 1998).

A Definitional indicator framework for distinguishing empathy and sympathy

A central objective of this study is not only to demonstrate that empathy and sympathy exhibit distinct knowledge structures at the bibliometric level, but also to translate these structural differences into a coherent and operational conceptual framework. Building on the comparative bibliometric results and the literature-based differentiation described above, this section formalizes a definitional indicator framework that delineates empathy and sympathy across the affective process, from motivational origins to behavioral outcomes.

Rather than proposing a new measurement scale or testing causal hypotheses, the framework is intended as a conceptual and analytical reference system. It provides a standardized basis for distinguishing empathy and sympathy in theoretical discussion, empirical research design, and applied contexts, thereby directly addressing the long-standing tendency to subsume sympathy under an overly broad conception of empathy.4.1 Framework rationale and structural logic

The framework is organized into four first-order dimensions: motivation and purpose, influencing factors, response characteristics, and outcome manifestations. These dimensions correspond to functionally distinct stages of the affective process and are analytically differentiated according to their temporal and causal roles.

Motivation and purpose capture the intentional orientation underlying emotional activation, why the emotion arises and toward what goal it is directed. Influencing factors describe the internal and situational conditions that shape elicitation and modulation, including physiological foundations and contextual cues. Response characteristics refer to the cognitive-affective and phenomenological features of the emotional experience itself, such as affective dominance and self-other boundary configuration. Outcome manifestations encompass behavioral expressions and social consequences following emotional engagement.

This process-oriented structure prevents conceptual overlap between analytical levels and ensures that empathy and sympathy are compared along commensurable dimensions rather than treated as loosely overlapping traits. Within this structure, 15 sec-order indicators are specified. Each indicator is defined comparatively to highlight prototypical differences between empathy and sympathy, rather than positioning them as simple intensity variations along a single continuum.

Table 7: Definitional indicator framework for empathy and sympathy.

First-order Dimension	Second-order Indicator	Empathy (core definition)	Sympathy (core definition)	Operational explanation (how to identify in research)
1. Motivation and Purpose	Emotional purpose	Co-experiencing another's adversity and seeking emotional convergence	Understanding another's suffering and seeking relief without co-experiencing	Empathy is identified when the goal is shared affective experience ("endure together"); sympathy is identified when the goal is supportive concern without emotional merging.
	Emotional motivation	Altruistic impulse often accompanied by self-involving affect	Reflective and conditional altruism constrained by self-interest boundaries	Empathy may involve both other-oriented concern and self-oriented distress regulation; sympathy is more evaluative and bounded ("help without self-sacrifice").
2. Influencing Factors	Physiological basis	Dominant activation of embodied simulation/ emotional resonance systems	Dominant activation of valuation/moral appraisal systems	Empathy is inferred when neural evidence reflects affect-sharing pathways; sympathy is inferred when evidence emphasizes appraisal/valuation networks.
	Activation mode	Bottom-up, automatic "hot" affective processing system	Top-down, controlled "cold" appraisal-based concern	Empathy is triggered rapidly by affective cues; sympathy is triggered through interpretive judgment and regulation.
	Emotional context	More dependent on perceived similarity, familiarity, or closeness	Similarity not required; may emerge toward distant or abstract targets	Empathy is stronger under in-group similarity; sympathy may occur toward out-groups or generalized suffering.
	Emotional cues	Concrete, vivid, salient emotional cues (e.g., facial pain, vivid narrative)	Abstract or generalized cues (e.g., moral narratives, contextual information)	Empathy is more cue-driven; sympathy is more information-driven.

First-order Dimension	Second-order Indicator	Empathy (core definition)	Sympathy (core definition)	Operational explanation (how to identify in research)
3. Response Characteristics	Affective-cognitive balance	Affective dominance and emotional immersion	Cognitive predominance and reflective concern	Empathy is defined by emotional sharing; sympathy is defined by understanding and concern with limited affective resonance.
	Self-other relationship	Self-other integration and boundary blurring	Clear self-other separation	Empathy involves partial emotional substitution ("I feel your pain"); sympathy maintains observer stance ("I feel for you").
	Substitutive feeling	Strong substitutive feeling and possible self-forgetfulness	Weak or absent substitutive feeling	Empathy is present when the observer experiences the target's emotion as their own; sympathy is present when concern occurs without internal emotional replacement.
	Attentional perspective	First-person experiential perspective ("feeling into")	Third-person observational perspective ("feeling for")	Empathy adopts the target's internal state; sympathy observes and evaluates the situation while maintaining distance.
	Emotional sharing	Emotional states are directly shared or mirrored	Emotional states are acknowledged but not mirrored	Empathy is identified when affective resonance occurs; sympathy is identified when emotional alignment is absent but concern persists.
	Identity positioning	"We-ness" orientation (shared emotional space)	"I-you" orientation (supportive but separate)	Empathy involves shared identity framing; sympathy retains differentiated roles between helper and target.
4. Outcome Manifestations	Behavioral nature	Self-transcending helping with higher tolerance for personal cost	Assistance-oriented helping constrained by self-protection	Empathy is reflected in helping that may involve sacrifice; sympathy is reflected in helping that remains bounded.
	Behavioral style	Immediate, affect-driven, sometimes impulsive actions	Deliberative, regulated, and strategically limited actions	Empathy tends to motivate rapid emotional responses; sympathy motivates planned support based on appraisal.
	Behavioral outcome	Jointly navigating adversity may involve individual emotional or material loss	Providing limited support often avoids substantial self-damage	Empathy predicts deeper emotional involvement and possible burnout risk; sympathy predicts sustainable support with emotional regulation.

Note. The neural associations reported under "Physiological basis" are indicative rather than exclusive and reflect dominant trends in the literature.

Content of the Definitional Indicator System

Table 7 presents the finalized definitional indicator framework. Across the four first-order dimensions, empathy and sympathy demonstrated systematic and internally consistent differences.

At the level of motivation and purpose, empathy was primarily oriented toward co-experiencing another person's emotional state, often involving strong altruistic impulses that may coexist with self-related distress regulation. Sympathy was oriented toward understanding and caring for another person while maintaining self-interest as a boundary condition; its altruism was more reflective and conditional than immersive.

Regarding influencing factors, empathy was more strongly associated with automatic affective resonance mechanisms, including neural systems implicated in emotional mirroring and embodied simulation, and was preferentially elicited by concrete and salient cues under conditions of perceived self-other similarity. Sympathy relied more heavily on controlled cognitive appraisal processes, engaged neural regions associated with valuation and moral judgment, and could be elicited even without familiarity or similarity, particularly in response to abstract moral information about suffering.

Differences became especially pronounced at the level of response characteristics. Empathy was marked by affective dominance, emotional sharing, and a tendency toward self-other integration, sometimes resulting in blurred boundaries and strong substitutive feelings. Sympathy was characterized by cognitive predominance, emotional distance, and clear self-other separation; it also involved feeling for others rather than feeling *as* others, and typically preserved an external observational perspective.

Finally, in terms of outcome manifestations, empathy more frequently produced intense and sometimes impulsive prosocial actions oriented toward shared emotional resolution and tolerance of personal cost. Sympathy tended to generate more regulated and strategically bounded helping behavior, emphasizing assistance and support without substantial self-sacrifice.

Taken together, these patterned differences indicate that empathy and sympathy are not merely variations of the same prosocial emotion, but represent distinct affective systems with different motivational bases, processing modes, and social functions.

Analytical value and applicability of the framework

The proposed indicator system serves three interrelated functions. Initially, it provides a conceptually precise vocabulary for distinguishing empathy and sympathy in theoretical discourse, reducing ambiguity caused by interchangeable usage. Subsequently, it offers a structured reference for empirical research, enabling scholars to design measures, tasks, or coding schemes with improved discriminant validity. Furthermore, the framework has clear translational relevance for applied domains such as clinical practice, moral education, organizational behavior, and affective computing, where misclassification of empathy and sympathy may lead to divergent practical outcomes.

Importantly, the framework does not assume that empathy and sympathy are mutually exclusive in real-world contexts. Rather, it clarifies their prototypical characteristics, thereby enabling future research to examine how the two emotions may co-occur, interact, or transform under specific situational and individual conditions.

DISCUSSION

Clarifying a longstanding conceptual ambiguity

The present study provides a systematic differentiation of empathy and sympathy as distinct prosocial emotions. Although both constructs are widely recognized as affective antecedents of helping behavior, existing literature has frequently conflated them, resulting in conceptual boundary erosion and the tendency to treat sympathy as a subordinate component of empathy (Bloom, 2016; Eisenberg *et al*., 2006). This ambiguity has limited theoretical precision and weakened discriminant validity in empirical measurement.

By integrating large-scale bibliometric evidence with classical theoretical perspectives, our findings demonstrate that empathy- and sympathy-related research exhibits divergent knowledge structures, developmental trajectories, and applied emphases. Empathy research has evolved into a mature and densely connected domain characterized by interdisciplinary expansion, whereas sympathy research remained comparatively fragmented and conceptually intertwined with empathy across several core themes. Consistent with longstanding philosophical and psychological arguments, empathy is primarily defined by emotional sharing and experiential resonance, whereas sympathy is grounded in appraisal-based concern and maintains emotional distance (Darwall, 1998; de Waal, 2008; Malbois, 2023). Importantly, these distinctions are not limited to isolated theoretical traditions but are repeatedly reflected in the organization and evolution of the broader research landscape.

Theoretical implications: from conceptual overlap to functional differentiation

The definitional indicator framework proposed here advances existing models of prosocial emotions in two key ways. Primarily, it shifts the analytical focus from isolated attributes, such as emotional intensity or cognitive involvement, to process-level differentiation. Previous debates have long questioned whether empathy should be primarily conceptualized as affective resonance or cognitive perspective-taking (Preston and de Waal, 2002; Decety and Jackson, 2004; Cuff *et al*., 2016). Our framework integrates empathy and sympathy across four sequential dimensions-motivation and purpose, influencing factors, response characteristics, and outcome manifestations-thereby conceptualizing them as distinct affective processes rather than loosely overlapping traits. This perspective reconciles prior findings showing that empathy can simultaneously facilitate altruistic action and generate personal distress (Batson *et al*., 1987; Eisenberg *et al*., 2006), whereas sympathy is more consistently associated with regulated helping behavior (Malti and Dys, 2018).

Moreover, the framework clarifies the long-standing debate concerning the altruistic nature of empathy. By separating motivational purpose from behavioral outcomes, our analysis suggests that empathy may concurrently encompass altruistic concern and self-focused distress regulation without compromising its prosocial function. Sympathy, in contrast, is more consistently characterized by cognitively mediated and normatively constrained concern, aligning more closely with moral evaluation than emotional substitution (Darwall, 1998; Batson and Eklund, 2007; Malbois, 2023).

Methodological implications: enhancing discriminant precision

A persistent challenge in prosocial emotion research is insufficient discriminant validity between empathy, sympathy, and related constructs such as compassion or perspective-taking (Cuff *et al*., 2016; Clark *et al*., 2019). Many widely used measures combine emotional sharing, cognitive understanding, and concern into composite scores, obscuring construct specific effects and generating inconsistent empirical findings.

The indicator framework proposed here offers a structured reference system for improving conceptual alignment between theory and measurement. By explicitly specifying distinguishable dimensions and operational indicators, researchers can clarify construct definitions prior to instrument development and experimental design. This approach aligns with classical recommendations that conceptual clarification should precede measurement construction (Cronbach and Meehl, 1955; Clark *et al*., 2019). More broadly, this study illustrates how bibliometric mapping can serve not only as a descriptive tool for identifying trends, but also as a methodological resource for conceptual refinement. Although bibliometric approaches have been widely

applied to map intellectual structures (Chen *et al*., 2010), their use for resolving foundational construct ambiguity remains underdeveloped. Our study demonstrates the feasibility of combining macro-level bibliometric evidence with theory-guided synthesis to support definitional differentiation.

Practical and applied significance

Clarifying the distinction between empathy and sympathy has direct implications for applied domains in which emotional engagement is a central mechanism. In clinical and caregiving contexts, excessive empathic immersion may contribute to emotional exhaustion and burnout, whereas sympathy-based concern may support sustained helping through stronger emotional regulation (Figley, 2002; Singer and Klimecki, 2014; Li *et al*., 2025). Differentiating these emotional processes is therefore critical for designing training programs that promote effective support while minimizing maladaptive empathic overload.

In education, organizational behavior, and human-computer interaction, conflating empathy with sympathy may produce mismatches between intended emotional engagement and actual behavioral outcomes. For example, affective computing research increasingly emphasizes whether artificial agents should simulate emotional resonance or provide supportive concern, as these functions entail different ethical risks and interactional consequences (Paiva *et al*., 2017; Liu and Sundar, 2018; Schlicher *et al*., 2025). The present framework provides a diagnostic and design-oriented reference system for specifying which prosocial emotion is being targeted, thereby supporting more ethically grounded and functionally precise applications.

LIMITATIONS

Several limitations should be acknowledged in interpreting the present findings. On the one hand, the proposed framework was derived from bibliometric evidence and theoretical synthesis rather than direct empirical validation. While this approach systematically organizes existing knowledge and identifies structural patterns, future studies should empirically test the discriminant, construct, and predictive validity of the proposed indicators using behavioral, psychophysiological, or experimental methodologies (Batchelder *et al*., 2017).

On the other hand, bibliometric analyses are influenced by database coverage and prevailing publication practices. The substantial imbalance in the volume of empathy-versus sympathy-related research may shape certain structural features of the observed knowledge networks (Bloom, 2016). Expanding future analyses to additional databases or non-English literature may enhance comparative insights and robustness.

Additionally, the substantial difference in the number of retrieved publications (4,413 for empathy vs. 247 for sympathy) may influence certain network metrics. Smaller datasets tend to yield sparser co-occurrence networks with lower connectivity, which could potentially underestimate thematic integration and cluster stability. In the sympathy network, the limited number of documents and citations may also increase sensitivity to parameter choices (e.g., minimum occurrence threshold) and reduce the reliability of cluster boundaries. Nevertheless, the observed fragmentation of sympathy research was consistent across multiple analytical methods-keyword co-occurrence, co-citation clustering, and burst detection-suggesting that the convergent structural pattern was not merely an artifact of sample size. This convergence strengthens the validity of our comparative findings.

FUTURE RESEARCH

Future research may extend the present findings along several theoretically and methodologically meaningful directions :

Empirical validation of the proposed operational framework is warranted

While the indicator system is derived from convergent structural evidence and classical theoretical distinctions, future studies should examine its construct validity, discriminant reliability, and predictive utility across diverse populations and socio-cultural contexts. Multi-method approaches-including controlled behavioral paradigms, psychophysiological measures (e.g., heart rate variability, skin conductance), and validated self-report instruments-would enable rigorous testing of the framework's applicability in prosocial behavior research. For instance, researchers could develop a psychometrically sound scale based on the fifteen second-order indicators or design experimental paradigms that manipulate motivational orientation and self-other boundaries to test the framework's discriminant predictions.

Domain-specific refinement may enhance contextual sensitivity

The framework could be adapted and tested within applied settings such as clinical intervention research, educational psychology, organizational behavior, and human-computer interaction. Examining how the proposed dimensions translate into assessment protocols, training programs, or affect sensitive system design would clarify their practical utility and boundary conditions.

Dynamic and interactional investigations are needed to capture temporal processes

Empathy and sympathy may not function as static constructs but rather fluctuate within ongoing social exchanges. Longitudinal observational designs, ecological momentary assessment, and immersive virtual reality paradigms could help elucidate how these emotional processes co-occur, shift, or differentiate over time in naturalistic contexts.

Cross-database and cross-linguistic expansion would further strengthen structural generalizability

Incorporating non-English publications and additional citation databases may enhance the robustness of comparative mapping results and reveal culturally embedded variations in prosocial emotion research trajectories.

Collectively, these research efforts will advance the understanding of prosocial emotions beyond conceptual differentiation toward a nuanced, process-oriented model, clarifying both their antecedents and functional consequences in applied settings.

CONCLUSION

This study provides the first comparative bibliometric evidence distinguishing empathy and sympathy as structurally divergent knowledge domains. Our findings reveal that empathy research has developed into a mature, interdisciplinary, and densely connected field, whereas sympathy research remains relatively fragmented and conceptually subsumed under empathy-related clusters. By integrating scientometric mapping with theoretical synthesis, we propose a four-dimensional operational indicator framework with fifteen second-order indicators, which offers a systematic reference for future empirical differentiation and measurement. This study not only clarifies a long-standing conceptual ambiguity but also demonstrates a data-driven approach to refining overlapping constructs in prosocial emotion research.

ABBREVIATIONS

ECQ: Empathic Components Questionnaire; **LLR:** Log-Likelihood Ratio; **LSI:** Latent Semantic Indexing; **MI:** Mutual Information; **SSCI:** Social Sciences Citation Index; **TS:** Topic Search; **VOS:** Visualization of Similarities; **VOSviewer:** Visualization of Similarities Viewer; **WoSCC:** Web of Science Core Collection; **COVID-19:** Coronavirus Disease 2019.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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REFERENCES

Araújo, C. A., Nandrino, J. L., & Martins, C. (2025). The Portuguese version of the Adolescent Measure of Empathy and Sympathy: Validation in a sample of adolescents. International Journal of Behavioral Development . Advance online publication. https://doi.org/10.1177/01650254251386777

Between callous-unemotional traits and empathy, prosociality, and guilt. Clinical Psychology Review,75,101809. https://doi.org/10.1016/j.cpr.2019.101809

Bloom, P. (2016). Against empathy:The case for rational compassion.Ecco/HarperCollins Publishers.

Kesner, L., &Horáček, J. (2017). Empathy-related responses to depicted people in art works. Frontiers in Psychology, 8, 228. https://doi.org/10.3389*/fpsyg.2017.00228*

*M*alti, T., & Dys, S. P. (2018). From being nice to being kind: Development of prosocial behaviors. Current Opinion in Psychology, 20 , 45–49. https://doi.org/10.1016/j.copsyc.2017.07.036

Barnett, M. A., Howard, J. A., King, L. M., & Dino, G. A. (1981). Helping behavior and the transfer of empathy. The Journal of Social Psychology, 115(1), 125-132. https://doi.org/10.1080/00224545.1981.9711995

Batchelder L, Brosnan M, Ashwin C. (2017). The Development and Validation of the Empathy Components Questionnaire (ECQ). PLoS ONE 12(1), e0169185. https://doi.org*/10.*1371/journal.pone.0169185.

Batson, C. D. (1987). Prosocial motivation: Is it ever truly altruistic? In L. Berkowitz (Ed.), Advances in Experimental Social Psychology,20,65–122,Academic Press. https://doi.org/10.1016*/S0065-2601(08)60412-8*

Batson, C. D., & Eklund, J. H. (2007). The empathy-altruism hypothesis: A reply to Cialdini, et al. In E. Harmon-Jones & P. Winkielman (Eds.), Social neuroscience (pp.199–210). Guilford Press.

Batson, C.D., & Shaw, L.L. (1991). Evidence for altruism: Toward a pluralism of prosocial motives. Psychological Inquiry, 2(2),107-122.

Bernhardt, B. C., & Singer, T. (2012). The neural basis of empathy. Annual Review of Neuroscience, 35 , 1–23. https://doi.org/10.1146/annurev-neuro-062111-150536

Buchanan, T. W., & Preston, S. D. (2016). When feeling and doing diverge: Neural and physiological correlates of the empathy-altruism divide. In J. D. Greene, I. Morrison, & M. E. P. Seligman (Eds.), Positive neuroscience (pp.89–104). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199977925.003.0007.

Campos, C., Rocha, N. B., & Barbosa, F. (2023). Dissociating cognitive and affective empathy across psychopathy dimensions: The *role of interoception and alexithymia. Frontiers in Psychology, 14* , 1082965. https://doi.org/10.3389/fpsyg.2023.1082965

Chen, C., Ibekwe-SanJuan, F., & Hou, J. (2010). The structure and dynamics of cocitation clusters: A multiple-perspective cocitation analysis. *Journal of the American Society for Information Science and Technology*, 61(7), 1386-1409. https://doi.org/10.1002/asi.21309

Chen, C. (2006). CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific lit*erature.Journal of the American Soc*iety for Information Science and Technology, 57(3),359-377. https://doi.org/10.1002/asi.20317

Cikara, M., & VanBavel, J. J. (2014). The neuroscience of intergroup relations: An integrative review. P*erspectives on Psychological Scienc*e, *9*(3), 245-274. https://doi.org/10.1177/1745691614527464

Clark, M.A., Robertson, M.M., & Young, S. (2019). "I feel your pain": A critical review of organizational research on empathy. J*ournal of Organiz*ational Behavior, 40(2), 166-192. https://doi.org/10.1002/job.2348

Colasante, T., & Malti, T. (2017). Resting heart rate, guilt, and sympat*hy: A developmental psy*chophysiological study of physical aggression. Psychophysiology, 54(11), 1770-1781. https://doi.org/10.1111/psyp.12915

Cronbach, L. J., & Meehl, P. E. (1955). Construc*t validity in* psychological tests. Psychological Bulletin, 52(4), 281-302. https://doi.org/10.1037/h0040957

Cuff, B. M. *P., Brown, S. J.*, Taylor, L. D., & Howat, D. J. (2014). Empathy: A review of the concept. Emotion Review, 8(2), 144-153. https://doi.org/10.1177/1754073914558466

Darwall, S. (1998). Empathy, sympathy, care. Philosophical Studies, 89(2-3), 261-282. *https://doi.org/10.1023/*A:1004289113917

Decety, J., & Jackson, P.L. (2004). The functional architecture of human empathy. Behavioral and Cognitive Neuroscience Reviews, 3(2), 71-100. https://doi.org/10.1177/1534582304267187

de Waal, F. (2009). The age of empathy: Nature's lessons for a kinder society . Harmony Books.

de Waal, F. B. M. (2008). Putting the altruism back into altruism: The evolution of empathy. Annual Review of P*sychology, 59(1), 279-300*. https://doi.org/10.1146/annurev.psych.59.103006.093625

Dys, S. P., Jambon, M., Buono, S., & Malti, T. (2023). Attentional control moderates the relation between sympathy and ethical guilt. The Journal of Genetic Psychology, 184(3), 198-211. https://doi.org/10.1080/00221325.2023.2177522

Eisenberg, N., Fabes, R.A. & Spinrad, T.L. (2007). Prosocial Development. In Handbook of Child Psychology (eds W. Damon, R.M. Lerner and N. Eisenberg,pp. 646–718). https://doi.org/10.1002/9780470147658.chpsy0311

Eisenberg, N., *Zuffianò, A., & Spinrad,* T. L. (2024). Are prosocial tendencies relevant for developmental psychopathology? The relations of prosocial behavior and empathy-related responding to externalizing problems, internalizing problems*, and autism spectrum disor*der.Development and Psychopathology,36(5), 2207-2217. https://doi.org/10.1017/s0954579424000063

Escalas, J. E., & Stern, B. B. (2003). *Sympathy and empathy: Emotiona*l responses to advertising dramas. Journal of Consumer Research, 29(4), 566-578. https://doi.org/10.1086/346251

Figley, C. R. (2002). Compassion fatigue: Psychotherapists' chronic lack of self-care. Journal of Clinical Psychology, 58(11), 1433-1441. https://doi.org/10.1002/jclp.10090

Gong, T., & Huang, Y. S. (2026). Witnessing robot mistreatment: A dual-path model of behavioral contagion and empathy in customer observers. Journal of Retailing and Consumer Services, 88, 104482. https://doi.org/10.10*16/j.jretconser.*2025.104482

Grütter, J., & Buchmann, M. (2021). Developmental antecedents of young adults' solidarity during the Covid-19 pandemic: The role of sympathy, social trust, and peer exclusion from early to late adolescence. Child Development, 92(5), e832-e850. https ://doi.org/10.1111/cdev.13660

Grütter, J., Gasser, L., Zuffianò, A., & Meyer, B. (2018). Promoting *inclusion via cross-group friend*ship: The mediating role of change in trust and sympathy. Child Development, 89(4), e414-e430. https://doi.org/10.1111/cdev.12883

Hall, J. A., & Schwartz, R. (2019). Empathy present and future. The Journal of Social Psychology, 159(3), 225-243. https://doi.org/10.1080/00224545.2018.1477442

Heyers, K., Schrödter, R., Pfeifer, L. S., Ocklenburg, S., Güntürkün, O., & Stockhorst, U. (2025). (State) empathy: How context matters.Frontiers in Psychology, 16,1525517. https://doi.org/10.3389/*fpsyg.2025.1525517*

Holloway, K. (2020). Empathy in narratives of British humanitarian workers assisting Spanish R*epublican refugees at th*e time of the retirada: Esme Odgers, Audrey Russell, Richard Rees and Lilian Urmston. Journal of Spanish Cultural Studies, 21(4), 503-517.

Kesner, L. (2017). Empathy-related responses to depicted people in artworks. Frontiers in Psychology,8,228-244. https://doi.org/10.3389/fpsyg.2017.00228

Klimecki, O. M., Leiberg, S., Ricard, M., & Singer, T. (2014). D*ifferential pattern of functional brain plast*icity after compassion and empathy training. Social Cognitive and Affective Neuroscience, 9(6), 873-879. https://doi.org/10.1093/scan/nst060

Krebs, D. L. (1975). Empathy and altruism. Journal of Personality and Social Psychology, 32(6), 1134-1146. https://doi.org/*10.1*037/0022-3514.32.6.1134

Li, M., Liu, B., Jia, Q., et alet al. (2025). More empathy for others, more hurt for one*self? Empathy f*or pa*in is* related to poor mental health and negative emotion regulation. BMC Psychology, 13(1), 240. https://doi.org/10.1186/s40359-025-02585-4

Liu, B. J., & Sundar, S. S. (2018). *Should machines express sympathy and empathy? E*xperiments with a health advice chatbot. Cyberpsychology, Behavior, and Social Networking, 21(10), 625-636. https://doi.org/10.1089/cyber.2018.0110

Malbois, E. *(2023).* What is sympathy? Understanding the structure of other-oriented emotions. Emotion Review, 15(1), 85-95. https://doi.org/10.1177/175407392211404 04

Malti, T. (2016). Toward an integrated clinical-developmental model of guilt. Developmental Review, 39,16–36. https://doi.org/10.1016/j.dr.2015.11.001

Malti, T., Dys, S. P., Colasante, T., & Peplak, J. (2018). Emotions and morality: New developmental perspectives. In C. C. Helwig (Ed.), New perspectives on moral development (pp.55–72). Psychology Press. https://doi.org/10.4324/9781315642758

Marková, I. (2016). The dialogical mind: Common sense and ethics. Cambridge University Press.

Meng, J., Zhang, R., Qin, J., Lee, Y.-J., & Lee, Y.-C. (2025). AI-mediated social support: The prospect of human-AI collaboration. Journal of Computer-Mediated *Communication, 30(4), zmaf013. https://doi.org/10.1093/*jcmc/zmaf013

Miller, P. A., & Eisenberg, *N.* (1988). The relation of empathy to aggressive and externalizing /antisocial behavior. Psychological Bulletin, 103(3), 324.

Ongley, S. F., & Malti, T. (2014). *The role of moral emo*tions in the development of children's sharing behavior. Developmental Psychology, 50(4), *1148*-1159. https://doi.org/10.1037/a0035191

Oveis, C., Horberg, E. J., & Keltner, D. *(2010). Compass*ion, pride, and social intuitions of self-other similarity. Journal of Personality and Social Psychology, 98(4), 618-630. https://doi.org/10.1037/a0017628

O'Connell K., Br*ethel-Haurwitz K.M.,* Rhoads S.A., et al. (2019). Increased similarity of neural responses to experienced and empathic distress in costly altruism. Scientifific Reports, 9(1),10774, https://doi.org/doi:10.1038/s41598-*019-47196-3.*

Paiva, A., Leite, I., Boukricha, H., & Wachsmuth, I. (2017). Empathy in virtual agents and robots: A survey. ACM Transactions on Interactive Intelligent Systems,7(3), 11,1-40. https://doi.org/10.11*45/2912150*

Preston, S.D., & de Waal, F.B.M. (2002). Empathy: Its ultimate and proximate bases. Behavioral and Brain Sciences, 25(1), 1-20. https://doi.org/10.1017/S0140525X02000 01*8*

*Salzani, C. (202*5). *Sy*mpathy, empathy, & co.: Moral sentimentalism and its discontents. In Animals, empathy, and anthropomorphism: The limits of imagination (pp.81–101). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-88028-5_5

Schlicher, M., Li, Y., Murthy, S. M. K., Sun, Q., & Schuller, B. W. (2025). Emotionally adaptive support: A narrative review of affective computing for mental health. Frontiers in Digital Health, 7, Article 1657031. https://doi.org/10.3389/fdgth.2025.1657031

Singer, T., & Klimecki, O. M. (2014). Empathy and compassion. Current Biology, 24(18), R875–-R878. https://doi.org/10.1016/j.cub.2014.06.054

Singer, T., Seymour, B., O' Doherty, J., Kaube, H., Dolan, R.J., & Frith, C.D. (2004*). Empathy for* pain involves the affective but not sensory components of pain. Science, 303(5661),1157-1162. https://doi.org/10.1126/science.1093535

Sommerlad, A., Huntley, J., Livingston, G., et al. (2021). Empathy and its associations with age and sociodemographic characteristics in *a large* UK population sample. PLos One, 16(9), e0257557. https://doi.org/10.1371/journal.pone.0257557

Song, *J. H.*, Colasante, T., & Malti, T. (2018). Helping Yourself Helps Others: Linking Children's Emotion Regulation to Prosocial Behavior Through Sympathy and Trust. Emotion, 18(4), 518-527.https://doi.org/10.1037/emo0000332

van Eck, N. J., & *Wa*ltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. Scientometrics, 84(2), 523-538. https://doi.org/10.1007/s11192-009-0146-3

Vecchio, G. M., Zava, F., Cattelino, E., Zuffianò, A., & Pallini, S. (2023). Children's prosocial and aggressive behaviors: The role of emotion regulation and sympathy. Journal of Applied Developmental Psychology, 89, Article 101598. https://doi.org/10.1016/j.appdev.2023.101598

Vossen, H. G. M., Piotrowski, J. T., & Valkenburg, P. M. (2015). Development of the adolescent measure of empathy and sympathy (ames). Personality; Individual Differences,74, 66-71.https://doi.org/10.1016/j.paid.2014.09.040

Waller, R.,Wagner, N. J., Barstead, M. G.,*et al.* (2020). A meta-analysis of the associations

Weisz, E., & Cikara, M. (2021). Strategic regulation of empathy. Trends in Cognitive Sciences, 25(3), 213-227. https://doi.org/10.1016/j.tics.2020.12.00*2*

Wispé, L. (1986). The distinction between sympathy and empathy: To call forth a concept, a word is needed.Journal of Personality and Social Psychology,50(2), 314-321. https://doi.org/10.1037/0022-*3514.50.2.314*

Yavuz, H. M., Colasante, T., Galarneau, E., & Malti, T. (2024). Empathy, sympathy, and emotion regulation: A meta-analytic review. Psychological Bulletin, 150(1), 27-44.https://doi.org/10.1037/bul0000426.

Zava, F., Cirimele, F., Perucchini, P., & Vecchio, G. M. (2025). Promoting sympathy, empathic self-efficacy, and prosocial behaviours among primary school children.International Journal of Psychology, 60(4), e70058.https://doi.org/10.1002/ijop.70058

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